

YAMAKAWA *et al.*, Appl'n No. 10/041,597
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IN THE CLAIMS:

1. (Currently Amended) An electrophoresis apparatus comprising a planar plate formed therein with a channel for electrophoretic separation and with at least one optical component, light irradiating means for irradiating an excitation beam into a detection part formed in a part of the channel, fluorescent detecting means for detecting a degree of fluorescence which is generated from a sample by the excitation beam, the channel having a cross-sectional shape and being composed of a top surface and a bottom surface which are parallel with a surface of the planar plate, and left and right side wall surfaces, a first flat and smooth incoming window formed in the bottom surface of the channel, a second flat and smooth incoming window formed on a surface of the planar plate at a position which is opposed to the first incoming window, for introducing an excitation beam into the planar plate, an excitation transmission path formed between the first and second incoming windows, a first flat and smooth outgoing window formed in one of side wall surfaces of the channel, for emitting fluorescence from the sample, and a second flat and smooth outgoing window formed in a surface of the planar plate at a position opposed to the first outgoing window, for emitting the fluorescence outside of the planar plate, and a fluorescent transmission path between the first outgoing window and the second outgoing window,

wherein the planar plate has the channel, the at least one optical component, the first flat and smooth incoming window, the second flat and smooth incoming window, the excitation transmission path, the first flat and smooth outgoing window,

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the second flat and smooth outgoing window and the fluorescent transmission path
~~integrally-molded therein are part of an integral casting of the planar plate.~~

2. (Currently Amended) An electrophoresis apparatus comprising a planar plate formed therein with a channel for electrophoretic separation and with at least one optical component, light irradiating means for irradiating an excitation beam into a detection part formed in a part of the channel, fluorescent detecting means for detecting a degree of fluorescence which is generated from a sample by the excitation beam, the channel being a capillary channel having a top surface and a bottom surface which are parallel with a surface of the planar plate, and left and right side wall surfaces, a first incoming window formed in one of side wall surfaces of the capillary channel, for introducing the excitation beam into the channel, a second incoming window formed on a surface of the planar plate at a position which is opposed to the first incoming window, for introducing an excitation beam into the planar plate, an excitation transmission path formed between the first and second incoming windows, a first outgoing window formed in the bottom surface of the channel, for emitting fluorescence from the sample, and a second outgoing window formed in a surface of the planar plate at a position opposed to the first outgoing window, for emitting the fluorescence outside of the planar plate, and a fluorescent transmission path between the first outgoing window and the second outgoing window,

wherein the planar plate has the channel, the at least one optical component, the first incoming window, the second incoming window, the excitation transmission path, the first outgoing window, the second outgoing window and the fluorescent

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transmission path integrally-molded therein, ~~are part of an integral casting of the~~
~~planar plate.~~

3. (Previously Presented) An electrophoresis apparatus as claimed in claim 1, wherein said planar plate is formed of a transparent member adapted to serve as said excitation transmission path and said fluorescent transmission path.

4. (Previously Presented) An electrophoresis apparatus as claimed in claim 1, wherein light converging means is provided to either or each of both said excitation transmission path and said fluorescent transmission path as said at least one optical component.

5. (Previously Presented) An electrophoresis apparatus as claimed in claim 1, wherein light splitting means is provided in said fluorescent transmission path as said at least one optical component.

6. (Previously Presented) An electrophoresis apparatus as claimed in claim 1, wherein a spatial filter is provided in said fluorescent transmission path as said at least one optical component.

7. (Previously Presented) An electrophoresis apparatus as claimed in claim 1, wherein said planar plate is composed of a first planar plate formed through transcription in one batch by means of a transcription mold incorporating a male structure for forming channels at predetermined positions and a male structure for

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forming the at least one optical component, and a second transparent plate joined to the first planar plate.

8. (Previously Presented) An electrophoresis apparatus as claimed in claim 7, wherein male and female structures in the transcription mold are fine structures which are formed by optically exposing and then developing a photosensitive resin film.

9. (Previously Presented) An electrophoresis apparatus as claimed in claim 7, wherein said first planar plate is made of thermosetting resin.

10. (Previously Presented) An electrophoresis apparatus comprising a planar plate formed therein with a channel for electrophoretic separation, light irradiating means for irradiating an excitation beam into a detection part formed in a part of the channel, fluorescent detecting means for detecting a degree of fluorescence which is generated from a sample by the excitation beam, the channel having a cross-sectional shape and being composed of a top surface and a bottom surface which are parallel with a surface of the planar plate, and left and right side wall surfaces, a first flat and smooth incoming window formed in the bottom surface of the channel, a second flat and smooth incoming window formed on a surface of the planar plate at a position which is opposed to the first incoming window, for introducing an excitation beam into the planar plate, an excitation transmission path formed between the first and second incoming windows, a first flat and smooth outgoing window formed in one of side wall surfaces of the channel, for emitting

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fluorescence from the sample, and a second flat and smooth outgoing window formed in a surface of the planar plate at a position opposed to the first outgoing window, for emitting the fluorescence outside of the planar plate, and a fluorescent transmission path between the first outgoing window and the second outgoing window;

wherein a plurality of planar plates, each of which corresponds to said planar plate, are stacked one upon another so that channels in said plurality of planar plates are overlapped with one another; light irradiating means is provided at a position where a single excitation beam from said light irradiating means can be led through the channels in the planar plates layered one upon another, and said fluorescent detecting means is provided at positions in extension of outgoing windows formed in side surfaces of said planar plates stacked one upon another.

11. (Previously Presented) An electrophoresis apparatus as claimed in claim 1, wherein a plurality of channels are formed in one and the same plane in said planar plate, light irradiating means is provided at a position where a single excitation beam from said light irradiating means can pass through said plurality of channels at the same time, and said fluorescent detecting means is provided at a position in extension of the outgoing window formed in the surface of the planar plate.

12. (Previously Presented) An electrophoresis apparatus as claimed in claim 2, wherein said planar plate is formed of a transparent member adapted to serve as said excitation transmission path and said fluorescent transmission path.

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13. (Previously Presented) An electrophoresis apparatus as claimed in claim 2, wherein light converging means is provided to either or each of both said excitation transmission path and said fluorescent transmission path as said at least one optical component.

14. (Previously Presented) An electrophoresis apparatus as claimed in claim 2, wherein light splitting means is provided in said fluorescent transmission path as said at least one optical component.

15. (Previously Presented) An electrophoresis apparatus as claimed in claim 2, wherein a spatial filter is provided in said fluorescent transmission path as said at least one optical component.

16. (Previously Presented) An electrophoresis apparatus as claimed in claim 2, wherein said planar plate is composed of a first planar plate formed through transcription in one batch by means of a transcription mold incorporating a male structure for forming channels at predetermined positions and a male structure for forming the at least one optical component, and a second transparent plate joined to the first planar plate.

17. (Previously Presented) An electrophoresis apparatus as claimed in claim 16, wherein male and female structures in the transcription mold are fine structures which are formed by optically exposing and then developing a photosensitive resin film.

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18. (Previously Presented) An electrophoresis apparatus as claimed in claim 16, wherein said first planar plate is made of thermosetting resin.

19. (Previously Presented) An electrophoresis apparatus comprising a planar plate formed therein with a channel for electrophoretic separation, light irradiating means for irradiating an excitation beam into a detection part formed in a part of the channel, fluorescent detecting means for detecting a degree of fluorescence which is generated from a sample by the excitation beam, the channel being a capillary channel having a top surface and a bottom surface which are parallel with a surface of the planar plate, and left and right side wall surfaces, a first incoming window formed in one of side wall surfaces of the capillary channel, for introducing the excitation beam into the channel, a second incoming window formed on a surface of the planar plate at a position which is opposed to the first incoming window, for introducing an excitation beam into the planar plate, an excitation transmission path formed between the first and second incoming windows, a first outgoing window formed in the bottom surface of the channel, for emitting fluorescence from the sample, and a second outgoing window formed in a surface of the planar plate at a position opposed to the first outgoing window, for emitting the fluorescence outside of the planar plate, and a fluorescent transmission path between the first outgoing window and the second outgoing window;

wherein a plurality of planar plates, each of which corresponds to said planar plate, are stacked one upon another so that channels in said plurality of planar plates are overlapped with one another, light irradiating means is provided at a position where a single excitation beam from said light irradiating means can be led through

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the channels in the planar plates layered one upon another, and said fluorescent detecting means is provided at positions in extension of outgoing windows formed in side surfaces of said planar plates stacked one upon another.

20. (Previously Presented) An electrophoresis apparatus as claimed in claim 2, wherein a plurality of channels are formed in one and the same plane in said planar plate, light irradiating means is provided at a position where a single excitation beam from said light irradiating means can pass through said plurality of channels at the same time, and said fluorescent detecting means is provided at a position in extension of the outgoing window formed in the surface of the planar plate.

21. (Currently Amended) An electrophoresis apparatus as claimed in claim 1, comprising at least one access opening for communication of fluid with said channel, wherein the second flat and smooth incoming window for introducing the excitation beam into the planar plate ~~is not formed on a same surface of the planar plate as~~ and the at least one access opening are normally accessible from mutually differing sides of the planar plate.

22. (Currently Amended) An electrophoresis apparatus as claimed in claim 1, comprising at least one access opening for communication of fluid with said channel, wherein said ~~a second flat and smooth outgoing window for emitting the fluorescence outside of the planar plate is not formed on a same surface of the planar plate as~~ and the at least one access opening are normally accessible from mutually differing sides of the planar plate.

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23. (Previously Presented) An electrophoresis apparatus as claimed in claim 1, wherein the fluorescent transmission path is bounded by an air gap on at least two sides thereof within the planar plate.

24. (Currently Amended) An electrophoresis apparatus as claimed in claim 2, comprising at least one access opening for communication of fluid with said channel, wherein the second incoming window for introducing the excitation beam into the planar plate ~~is not formed on a same surface of the planar plate as and~~ the at least one access opening are normally accessible from mutually differing sides of the planar plate.

25. (Currently Amended) An electrophoresis apparatus as claimed in claim 2, comprising at least one access opening for communication of fluid with said channel, wherein said a second outgoing window for emitting the fluorescence outside of the planar plate ~~is not formed on a same surface of the planar plate as and~~ the at least one access opening are normally accessible from mutually differing sides of the planar plate.

26. (Previously Presented) An electrophoresis apparatus as claimed in claim 2, wherein the fluorescent transmission path is bounded by an air gap on at least two sides thereof within the planar plate.